Gp 2613 AF 2700 #10 1-29-04 P.2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

OIPE JC133 JAN 16 2004 PATENT & TRADEMARK OFFICE

In re Application of	Atty. Docket
ROB A. BEUKER	PHN 17,569
Serial No.: 09/624,522	Group Art Unit: 2613
Filed: July 24, 2000	Examiner: T.T. Vo

Title: MOTION ESTIMATION

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Enclosed is an original plus two copies of an Appeal Brief in the above-identified patent application.

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Respectfully submitted,

By [signature]
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BRIEF FOR APPELLANT

This is an appeal from the Examiner of Group 2613 finally rejecting claims 1-8 in this application.

(1) Real Party in Interest

The real party in interest in this application is U.S. PHILIPS CORPORATION by virtue of an assignment from the invention recorded on July 24, 2000, at Reel 011004 Frame 0225.

(2) Related Appeals and Interferences

There are no other appeals and/or interferences related to this application.

(3) Status of the Claims

Claims 1-8 stand finally rejected by the Examiner.

(4) Status of Amendments

There was one (1) Response filed on November 5, 2003, after final rejection of the claims on September 24, 2003, which was considered by the Examiner.

(5) Summary Of The Invention

The subject invention relates to motion estimation. As shown in the Figure and described in the specification on page 6, line 17 to page 7, line 2, a picture signal is applied to a block-based motion vector estimator BME and a global motion-vector estimator GME. The BME applies a most frequently used motion vector MFMV and a second-most frequently used motion vector SMFMV to the GME, and the GME applies a global motion vector GMV to the BME. The output of the BME and the output of the GME are selectively applied to a motion-compensated processor MCP which applies its output to a display device DD.

As described in the specification on page 5, lines 16-26, the full motion estimator (i.e., the combination of the BME and the GME) gets the GMV from the GME, uses this vector for the 6-candidate 3-D Recursive Search motion estimation BME, extracts the most used and second-most used global motion vectors from the

resulting motion field, uses these motion vectors in the GME, and extracts the global motion from the resulting motion field. The 6-candidate 3-D Recursive Search motion estimation is described in the specification on page 3, line 30 to page 4, line 5, and uses the following candidates: 1. The most-used global motion vector (which is also used as the best global motion vector); 2. The spatial vector of block (x-1, y-1)(upper left); 3. The spatial vector of block (x+1, y-1)(upper right); 4. The temporal vector of the current block; 5. The temporal vector of block (x, y+1)(lower); and 6. An update of the spatial vector of block (x-1, y-1) if x is even and of block (x+1, y-1) if x is odd.

(6) Issues

(A) Whether the invention, as claimed in claims 1 and 4-7, is anticipated, under 35 U.S.C. 102(b), by U.S. Patent 5,473,379 to Horne.

(B) Whether the invention, as claimed in claims 2 and 3, is unpatentable, under 35 U.S.C. 103(a), over Horne in view of U.S. Patent 6,462,791 to Zhu.

(C) Whether the invention, as claimed in claim 8, is unpatentable, under 35 U.S.C. 103(a), over Horne in view of U.S. Patent 6,385,245 to De Haan et al.

(7) Grouping Of Claims

Appellant asserts that claims 1 and 4-7 stand and fall together; claims 2 and 3 stand and fall together; and claim 8 stands and falls alone.

(8) Arguments

(A) The Horne patent discloses a method and apparatus for improving motion compensation in digital video coding, in which the global motion vector is used to define a search window for the motion estimator. Within this search window, as defined by the global motion vector, motion vectors are sought by means of some motion vector estimation process.

In the subject invention, a block-based motion vector estimation process is carried out that involves comparing a plurality of candidate motion vectors to determined block-based motion vectors; a most frequently occurring block based motion vector is determined; a global motion vector estimation process is carried out using at least the most frequency occurring block-based motion vector to obtain a global motion vector; and the global motion vector is applied as a candidate vector to the block-based motion vector estimation process. Appellant submits that these features are clearly set forth in the elements of claim 1.

In the Advisory Action, the Examiner states "It is noted that the global motion vector is included in the plurality of candidate

motion vectors to be compared to determine the block based motion vectors is not claimed before, so this argument is not persuasive."

Appellant respectfully submits that the Examiner is mistaken. In particular, claim 1 states "carrying out a block-based motion vector estimation process that involves comparing a plurality of candidate vectors to determine block-based motion vectors". Claim 1 further states "applying the global motion vector as a candidate vector to the block-based motion vector estimation process." As such, it is quite evident that according to claim 1, the global motion vector is ~~indeed~~ included in the plurality of candidate vectors to be compared to determine the block based motion vectors.

It is Appellant's contention that this is neither shown nor suggested by Horne, in which the global motion vector is only used to determine a window.

The Examiner states:

> "… applying the global motion vector as a candidate vector to the block-based motion vector estimation process (330 of fig. 3A; e.g. the step (330) receives the global motion vector from the motion estimator (106 of fig. 1); see also col. 11, lines 47-58)."

Appellant submits that the Examiner is either misreading or misconstruing Horne. While the global motion vector is indeed applied to the block-based motion estimator (104 of Fig. 1), at step 330 of the flowchart of Fig. 3A, and the ensuing step 332 sets the variable GM equal to the global motion vector GMV, Applicant would like to point out that Fig. 3A also shows that step 332 feeds

back to step 302 where new data $DB_{i,t}$ is received and from there to step 310 where $A_{ref} = F\{BP_{i,t}, GM\}$, which is described at col. 9, lines 31-38, which states:

> "Next, in step 310, the search window A_{ref} within the reference frame is defined. A_{ref} is video data representing the portion of the reference frame within which a displaced block MB_{ref} for $DB_{i,t}$ may be located. The location of A_{ref} within a the reference frame is defined by first centering A_{ref} on the new block position $BP_{i,t}$, and then displacing A_{ref} by an amount defined by the stored global motion vector GM."

As such, it should be clear that GM is being used to determine the window A_{ref}. A further examination of Fig. 3A leads to the fact that GM is not used anywhere else in determining the best (most frequently occurring) block-based motion vector $MV_{i,dt}$. As such, GM, the global motion vector, is only used to determine the window A_{ref}. However, claim 1 specifically states "carrying out a block-based motion vector estimation process that involves **comparing a plurality of candidate vectors to determine block-based motion vectors**" (emphasis added), and "applying the global motion vector as a candidate vector to the block-based motion vector estimation process".

page 4 lines 15-20

With respect to claim 4, Appellant further contends that there is no disclosure or suggestion in Horne of additionally using the second most frequently occurring motion vector in determining the global motion vector.

In response, the Examiner states:

"It is submitted that Horne teaches using second most

frequently occurring vector to obtain the global vector)(i.e. a second best block-based motion vector (second-most frequently occurring block-based motion vector) is determined by the step (318 of fig. 3A) and then being transmitted to the global motion estimator (106 of fig. 1) by the step of (322); see also col. 11, lines 29-31, 47-56)."

Again, Appellant submits that the Examiner is either misreading or misconstruing Horne. In particular, referring to Fig. 3A, step 316 determines MB_{ref}, the best matched block within the window A_{ref}. Step 318 establishes the best matched motion vector using the formula $MV_{i,dt} = BP_{i,t}$ - (position of first pel in MB_{ref}). (Note that the Examiner admits that $MV_{i,dt}$ is best matched (most frequently occurring) block-based motion vector in the previous paragraph of the Office Action relating to claim 1). Further, the sections of the patent referred to by the Examiner read as follows:

> "In step 322, the motion vector $MV_{i,dt}$ is provided to the global motion estimator";

and

> "In step 328, the processor determines whether there are more new data blocks within the current frame to be compensated. This information may suitably be provided by the control circuitry. If no, the processor retrieves a new global motion vector GMV from the global motion estimator in step 330. The global motion estimator may suitably operate according to the method discussed below in connection with FIG. 4. In step 332, the new global motion vector is stored as GM for use within the motion estimator 104 for processing the next video frame, which in motion compensation prediction would typically be F_{t+1}."

Appellant submits that it should be clear from reading these sections that there is no suggestion of determining the second most

frequently occurring motion vector, and that in Horne, the only motion vectors "sent" to the global motion estimator 106 are the best matched (most frequently occurring) block-based motion vectors $MV_{i,dt}$. Hence, Horne neither shows nor suggests additionally using the second most frequently occurring motion vector in determining the global motion vector.

(B) Appellant's arguments concerning Horne are incorporated herein.

The Zhu patent discloses constrained motion estimation and compensation for packet loss resiliency in standard based CODEC which arguably discloses making a selection among block-based motion vectors having a corresponding motion error below a given motion error threshold.

Appellant, however, submits that Zhu fails to disclose or suggest that which is missing from Horne, i.e., that the global motion vector is used as a candidate vector in a block-based motion vector estimation process (BME) that involves comparing a plurality of candidate vectors (including the global motion vector) to determine a motion vector.

(C) Appellant's arguments concerning Horne are incorporated herein.

The De Haan et al. patent discloses motion estimation and motion-compensated interpolation which discloses applying the output video from a motion compensation arrangement to a display unit.

Appellant, however, submits that De Haan et al. fails to disclose or suggest that which is missing from Horne, i.e., that the global motion vector is used as a candidate vector in a block-based motion vector estimation process (BME) that involves comparing a plurality of candidate vectors (including the global motion vector) to determine a motion vector.

(9) Conclusion

Based on the above arguments, Appellant believes that the subject invention is neither anticipated nor rendered obvious by the prior art and is patentable thereover. Therefore, Appellant respectfully requests that this Board reverse the decisions of the Examiner and allow this application to pass on to issue.

Respectfully submitted,

by Edward W. Goodman
Edward W. Goodman, Reg. 28,613
Attorney

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On January 14, 2004

By Burnett James

(10) Appendix

CLAIMS ON APPEAL

1. (Previously Presented) A motion vector estimation method, comprising the steps:

carrying out a block-based motion vector estimation process that involves comparing a plurality of candidate vectors to determine block-based motion vectors;

determining at least a most frequently occurring block-based motion vector;

carrying out a global motion vector estimation process using at least the most frequently occurring block-based motion vector to obtain a global motion vector; and

applying the global motion vector as a candidate vector to the block-based motion vector estimation process.

2. (Previously Presented) The method as claimed in claim 1, wherein the determining step includes:

making a selection among block-based motion vectors having a corresponding motion error below a given motion error threshold.

3. (Previously Presented) The method as claimed in claim 1, wherein the determining step includes:

making a selection among block-based motion vectors estimated for blocks having a difference between maximum and minimum pixel values above a given activity threshold.

4. (Previously Presented) The method as claimed in claim 1, wherein both the most frequently occurring block-based motion vector and a second-most frequently occurring block-based motion vector are determined and used in the global motion vector estimation process.

5. (Previously Presented) The method as claimed in claim 1, wherein said global motion vector estimation process includes the steps:

comparing, on a block basis, a plurality of candidate vectors, including the most frequently occurring block-based motion vector, to obtain best vectors determined per block; and

outputting a most-frequently occurring best vector determined per block as the global motion vector.

6. (Previously Presented) A motion vector estimation device, comprising:

block-based motion vector estimation means for determining block-based motion vectors based on a comparison of a plurality of candidate vectors;

means for determining at least a most frequently occurring block-based motion vector;

means for carrying out a global motion vector estimation process using at least the most frequently occurring block-based motion vector to obtain a global motion vector; and

means for applying the global motion vector as a candidate vector to the block-based motion vector estimation means.

7. (Previously Presented) A motion-compensated picture signal processing apparatus, comprising:

a motion vector estimation device as claimed in claim 6 for generating motion vectors; and

a motion-compensated processor for processing a picture signal in dependence on the motion vectors.

8. (Previously Presented) A picture display apparatus, comprising:

a motion-compensated picture signal processing apparatus as claimed in claim 7 to obtain a processed picture signal; and

a display device for displaying the processed picture signal.